

Appln. S.N. 10/696,335
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Reply to Final Office Action of September 28, 2006
Docket No. 200313765-1

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In the claims:

1-48. (Cancelled)

49. (Currently amended) A solid three-dimensional prototype composition, comprising:

multiple layers of pre-ceramic deposited in contact with one another, each of said multiple layers of pre-ceramic comprising a particulate blend including a single source of calcium phosphate source;

wherein said particulate blend was hydrated by a solubilizing binder to dissolve calcium phosphate of said single source of calcium phosphate source in said particulate blend, with reprecipitation of said calcium phosphate producing said pre-ceramic.

50. (Original) The composition of claim 49, wherein said pre-ceramic comprises hydroxyapatite.

51. (Previously presented) The composition of claim 49, wherein said binder comprises:

wetting agents;
humectants; and
surfactants.

52. (Previously presented) A solid three-dimensional prototype composition, comprising:

multiple layers of pre-ceramic deposited in contact with one another, each of said multiple layers of pre-ceramic comprising a particulate blend including a calcium phosphate source;

wherein said particulate blend was hydrated by a solubilizing binder to produce said pre-ceramic;

wherein said particulate blend comprises:

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tetracalcium phosphate;
citric acid;
CaAl-LDH (NO₃);
poly acrylic acid (60k);
Li₃PO₄; and
magnesium fluoride.

53. (Original) The composition of claim 49, wherein said pre-ceramic has a compression modulus of 0.05 Giga-Pascal.

54. (Original) The composition of claim 49, wherein said pre-ceramic is configured to produce a ceramic upon firing.

55. (Original) The composition of claim 54, wherein said ceramic is configured to have a compression modulus over 14.0 Giga-Pascal.

56-62. (Cancelled)

63. (Currently amended) The composition of claim 49, wherein said layer of pre-ceramic further ~~comprising~~ comprises a reaction retardant.

64. (Previously presented) The composition of claim 63, wherein said reaction retardant modifies a pH of said particulate blend thereby preventing premature reactions.

65. (Previously presented) The composition of claim 49, further comprising a layered double hydroxide.

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66. (Previously presented) The composition of claim 49, wherein said particulate blend further comprises an accelerant to promote hardening of said pre-ceramic upon application of said binder.

67. (Previously presented) The composition of claim 49, wherein said binder further comprises a pH modifier.

68. (Previously presented) The composition of claim 49, wherein said layers of pre-ceramic are disposed at edges of layers of said particulate blend so as to form a shell around a quantity of said particulate blend corresponding to a shape of an object being formed.

69. (Currently amended) A composition for forming a solid three-dimensional prototype, said composition[[.]] comprising:

a particulate blend including a single source of calcium phosphate source from which pre-ceramic layers of an object being fabricated are formed; and

a solubilizing binder for selective introduction into said particulate blend, wherein said binder is configured to dissolve calcium phosphate of said single source of calcium phosphate source, with reprecipitation of said calcium phosphate producing said pre-ceramic.

70. (Currently amended) The composition of claim 69, wherein said solubilizing binder comprises [[a]] a humectant or a surfactant.

71. (Currently amended) The composition of claim 69, wherein said single source of calcium phosphate source comprises at least one of a tetracalcium phosphate, a monocalcium phosphate (MCP), a monocalcium phosphate monohydrate (MCPM), a $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$, a dicalcium phosphate (DCP), a dicalcium phosphate

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dehydrate (DCPD), a CaHPO_4 , a $\text{CaHPO}_4 \cdot \text{H}_2\text{O}$, an α -tricalcium phosphate, a β -tricalcium phosphate or hydroxyapatite.

72. (Previously presented) The composition of claim 69, wherein said particulate blend further comprises a reaction accelerant.

73. (Previously presented) The composition of claim 72, wherein said reaction accelerant comprises one of a lithium phosphate, an aluminum nitrate, or an iron nitrate.

74. (Previously presented) The composition of claim 69, wherein said particulate blend further comprises polyacids.

75. (Previously presented) The composition of claim 74, wherein said polyacids comprise one of a polyvinyl phosphoric acid, a homo- or a copolymer of unsaturated aliphatic carbonic acid, a polyvinyl sulphonic acid, a polystyrene sulphonic acid, or a polyacrylic acid (PAA).

76. (Currently amended) The composition of claim 69, wherein said particulate blend further comprising comprises a reaction retardant.

77. (Previously presented) The composition of claim 76, wherein said reaction retardant comprises one of a citric acid, an oxalic acid, an ethylenediamine tetraacetic acid, a sodium phosphate, a tartaric acid, or a salicylic acid.

78. (Previously presented) The composition of claim 69, wherein said particulate blend further comprises a layered double hydroxide.

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79. (Currently amended) The composition of claim 78, wherein said layered double hydroxide comprises one of ~~GaAl-LDH, MgAl-LDH, ZnAl-LDH, CaAl-LDH, MgAl-LDH or ZnAl-LDH.~~

80. (Currently amended) The composition system of claim 78, wherein said layered double hydroxide comprises a phosphate, a sulfate, a nitrate, a carbonate, or a polyanion, wherein said phosphate, sulfate, nitrate, carbonate, or polyanion is intercalated into said layered double hydroxide.

81. (Currently amended) The composition system of claim 78, wherein said layered double hydroxide is based on one of magnesium, zinc, aluminum, calcium, or iron.

82. (Currently amended) A composition for forming a solid three-dimensional prototype, said composition comprising:

a particulate blend including a calcium phosphate source from which pre-ceramic layers of an object being fabricated are formed. ~~The system of claim 60,~~ wherein said particulate blend comprises:

tetracalcium phosphate;

citric acid;

CaAl-LDH (NO₃);

polyacrylic acid (60k);

Li₃PO₄; and

magnesium fluoride; and

a solubilizing binder for selective introduction into said particulate blend, wherein said binder is configured to dissolve calcium phosphate of said calcium phosphate source, with reprecipitation of said calcium phosphate producing said pre-ceramic.

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83. (Currently amended) A composition for forming a solid three-dimensional prototype, said composition comprising:

a particulate blend including a calcium phosphate source from which pre-ceramic layers of an object being fabricated are formed. The system of claim 69, wherein said solubilizing binder comprises:

phosphoric acid (H₃PO₄);
2-pyrrolidone;
liponic ethylene glycol (LEG-1);
SURFYNOL 465;
Water;
1,5-pentanediol; and
TERGITOL-15-s-7; and

a solubilizing binder for selective introduction into said particulate blend, wherein said binder is configured to dissolve calcium phosphate of said calcium phosphate source, with reprecipitation of said calcium phosphate producing said pre-ceramic.

84. (Currently amended) The composition method of claim 69, wherein said binder comprises a pH modifier.

85. (Currently amended) The composition method of claim 84, wherein said pH modifier comprises one of a phosphoric acid (H₃PO₄), a mineral acid, a phytic acid, an acetic acid, an ethanoic acid, a potassium hydroxide (KOH), a lithium hydroxide (LiOH), a sodium hydroxide (NaOH), a NH₄OH, an aluminum hydroxide (Al(OH)₃), a magnesium hydroxide (Mg(OH)₂), a calcium hydroxide (Ca(OH)₂), or a barium hydroxide (Ba(OH)₂).